DIRECTOR'S REPORT

Advancing Science within the Bureau of Land Management

February 2012

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INTRODUCTION

The Bureau of Land Management (BLM) has a critical and compelling mission: *to sustain the health, diversity, and productivity of America's public lands for the use and enjoyment of present and future generations.* Distinctive to its mission within the Department of the Interior (DOI) are the BLM's core purposes of multiple use and sustained yield. Resource development, restoration, and conservation are all essential activities of the BLM.

Fulfilling its mission requires leadership and field managers to make important decisions about natural and cultural resources under BLM's management. These decisions often impact adjacent lands, waters, and communities. They often impact other federal and state resource management agencies. They take place within a broad and complex environmental, legal, socioeconomic, scientific, and political context. Hence, effective BLM decision-making must reflect best available sound science, accurate fidelity to the law, and long-term public interest.

The BLM must be a "science-informed" bureau. Science for the BLM includes the full range of disciplines within the biophysical and socioeconomic sciences relevant to the multiple-use mission of the BLM. It includes monitoring, research, syntheses of existing science, and application of findings to meet BLM resource management needs. BLM science (science conducted by the BLM and/or for the BLM) should be mission-oriented, place-based, high-quality, objective, and result in usable knowledge for BLM managers and stakeholders.

Given the extent of current and future environmental and socioeconomic change—including energy development, demographic trends, climate change, and water demands—the scientific needs of the BLM are necessarily increasing. Like other federal land management agencies, the BLM must employ science as it "manages for change".

To prepare the BLM to effectively manage now and in the future, the science it uses must be expanded, improved, and more deeply integrated into the bureau's culture and decision-making

processes. In May 2012, BLM Director Abbey commissioned a Director's Report that would assist in advancing science within the BLM. Director Abbey asked that the BLM's National Landscape Conservation System (NLCS) serve as a pilot in this effort.

The BLM has produced several strategic plans for science. These documents include detailed objectives, research agendas, processes for priority setting, and implementation actions. The development of an additional strategic plan or an update of existing on-the-shelf plans is unlikely to have significant impact on the bureau's approach to and use of science. Rather, this Director's Report focuses on specific recommendations for: a) advancing science within the BLM, b) integrating science into BLM decision making, and c) accelerating the progress of advancement and integration of science for the BLM.

How this Director's Report was Prepared

BLM Director Bob Abbey requested that Dr. Gary Machlis, Science Advisor to the Director of the National Park Service, prepare the report. Dr. Machlis co-leads the DOI Strategic Sciences Group, and is a professor of conservation at the University of Idaho. Dr. Machlis formed a core group that included Dr. Matt Preston, NLCS National Science Coordinator, and Dr. Healy Hamilton, an independent scientist with experience working with BLM managers. An executive committee of BLM field and national leadership was formed to provide guidance, assistance, and review of the Director's Report.

The core group conducted a detailed review of over 75 laws, regulations, policies, and plans related to science within the BLM. In addition, they conducted over 40 detailed interviews with a range of individuals including: a) BLM leaders and managers at the national, state, and field levels, b) BLM scientists and professionals, and c) external scientists with knowledge of BLM science, such as USGS scientists and university faculty. These interviews were not a formal representative sample, but did provide a range of insights regarding advancing science in the BLM. The core group met with BLM managers within the NLCS at their 2012 management conference in Albuquerque, NM. They traveled to the BLM National Operations Center (NOC) in Lakewood, CO and met with a range of group leaders and staff. A draft of this report was reviewed by the executive committee and comments were provided to the core group. A final

draft was completed, reviewed by the executive committee, and prepared by Dr. Machlis and other members of the core group for delivery to the BLM Director.

BACKGROUND

Authorities and Mandates

The BLM has legal, regulatory, and policy authorities and mandates to conduct science. The Federal Land Policy and Management Act of 1976 (FLPMA) provides the BLM explicit authority to conduct management-related science and requires the systematic consideration of scientific information when developing land use plans. Other authorities require scientific investigation and consultation before BLM actions (e.g. NEPA, Endangered Species Act), while some legislation requires scientific tasks on specific topics (e.g. inventory and monitoring of archaeological resources). More generally, the DOI policy manual (e.g. §305 DM 2) describes how science shall be integrated and used in management practices and decisions. Similar mandates for incorporating science into management are in several other DOI and BLM policy documents (e.g. BLM Manual §1601), including those related to the NLCS (e.g. Secretarial Order 3308; BLM Manual §6100).

The bureau also has an obligation to ensure that BLM lands remain a resource for the scientific community. FLPMA, the NLCS' Organic Act, and several individual laws creating NLCS units call for the protection of the scientific values of BLM lands, i.e. the protection of resources deemed to be of importance to scientific research.

Organizational Support for BLM Science

BLM scientific expertise is spread throughout the bureau. In the Washington Office there are several individuals tasked with providing scientific advice and/or coordination; most do not work full-time on science projects or policies. Many are affiliated with specific programs and focus on applying relevant science to these programs. There are also scientists assigned to multi-state zones who provide expertise to BLM offices.

In State and Field Offices, many resource staff members have scientific backgrounds. The majority of BLM's field-level scientific expertise is focused on interpretation and application of available science, rather than the conduct of scientific research as part of their workload.

The NOC's Division of Resource Service houses a group of BLM's senior technical specialists, including some who conduct scientific research. The Washington Office uses their expertise to conduct and support national-level projects. Some State and Field Offices utilize NOC technical expertise as well.

The BLM has outsourced substantial scientific work to partners that include local, tribal, state and federal governments, academic institutions, professional societies, industry groups, entities under land use authorizations, non-governmental organizations, citizen groups, and contractors.

Scientific funding is spread throughout the bureau. In FY11 about $15 million was spent on applied research projects across the BLM States. Some scientific activities, such as monitoring, are not included in this amount. Funding does not come from a centralized pool and is spent on an *ad hoc*, office-by-office basis.

The BLM chartered an external Science Advisory Board under the Federal Advisory Committee Act (FACA) in the late 1990s and early 2000s to provide scientific advice to the BLM Director. It is no longer active. Various versions of an internal National Science Committee have been formed to coordinate, prioritize, and communicate scientific endeavors. At times the Director has had a science advisor. Current and developing science-related committees include the BLM Science Committee/Core Science Team (the most recent version of a National Science Committee), the NLCS Science Advisory Team, the Data Advisory Committee/Working Group, and the Socio-economic Oversight Committee.

BLM Science Strategies

The BLM has prepared several overarching science strategies, including versions in 1991, 1996, 2000, and 2008. A science strategy for the NLCS was prepared in 2007. These strategies share several themes and goals. Each of the science strategies recognize the need to: a) systematically identify research needs; b) engage with science partners; and c) transfer research results to

managers and to the public. Implementation plans, or draft implementation plans, have been written for several of the strategies.

Other currently available science-related strategies include a socioeconomic strategic plan, a geo-spatial strategic plan, the joint fire science plan, and NLCS unit science strategies. The latter has been completed in a few NLCS units and a new template for unit strategies was recently developed that includes the unit's scientific background, scientific needs, engagement with partners, and more.

While not a formal "science strategy", the BLM's recent adoption of a landscape approach is a framework for science-informed management, with scientific data, assessments, and projections forming the base from which to develop management direction and decisions. It builds upon previous BLM field applications, such as the Northwest Forest Plan and the Interior Columbia Basin Ecosystem Management Project. This approach connects regional and local decisions to landscape-scale understanding (e.g. BLM's rapid ecoregional assessments, REAs). The landscape approach requires standardization of assessment, inventory, and monitoring (AIM) efforts by instituting common indicators, statistically-valid data collection, and centralized data storage (i.e. BLM's AIM Strategy).

Results of Interviews with BLM Staff and Partners

Amongst interviewees there was widespread but not universal agreement that the primary obstacle to integrating science into BLM decision making is organizational culture. The BLM is viewed as a decentralized agency with inconsistent direction from leaders at multiple levels concerning the integration of scientific information into decision making. Pressure to incorporate available science in the planning and use authorization processes is often viewed as arising from external forces, such as litigation. There was general recognition that the need for science to become a more ingrained component of BLM decision-making has never been greater, as the multiple, complex, and interacting forces of environmental and socioeconomic change (e.g. intensified fire regimes, resource development, invasive species, and climate change) erase the concept of "business-as-usual" for the BLM.

Interviewees felt that the range of disciplines that provide information potentially useful to BLM decisions is broad and diverse, including life, earth, and socioeconomic sciences, and the pace of discovery and advancement is fast and increasing. There was recognition that it is impractical for BLM to maintain internal scientific expertise in all these fields with responsibilities to conduct research, assist managers in translating data to decisions, and keep abreast of the latest advances in their respective fields. Those interviewed frequently mentioned the resulting emphasis on the essential role of science partners. A recurring theme emerged that existing partnerships are often underperforming relative to their potential. For example, perception of the quality, timeliness, and accountability of science requested and funded by the BLM and conducted by USGS greatly varied. While some interviewees were satisfied, the majority of BLM-USGS interactions were not regarded as a productive return on investment or as an effective agency-wide strategy for injecting usable science into management decisions. The Cooperative Ecosystems Studies Units were repeatedly mentioned as logical partners to more actively cultivate as science providers to the BLM. Establishing closer ties to relevant professional societies (e.g. Society for Range Management) was consistently mentioned as another potential underutilized avenue.

The interviews highlighted specific scientific needs required to support BLM activities at different scales. The most consistent need involved the translation of available scientific data into usable knowledge that managers can easily and rapidly incorporate in the process of decision making. In addition to science translation, there was a recognized need to organize and increase accessibility to existing data. Another science need identified by interviewees was better understanding of the implications of the forces of global change at multiple scales, from the project up to the landscape, and the incorporation of this understanding into decisions across these scales.

Finally, the NLCS was widely regarded by interviewees as a valuable locale for advancing BLM science, though it was often viewed as being isolated from the rest of the bureau's activities and core mission. Many interviewees saw the NLCS as a reference point for understanding the impacts of change drivers in the relative (but not complete) absence of extractive practices, as well as a location to conduct science in support of adaptive management. The NLCS was often

viewed as a system that could be utilized for experimental testing of alternative methods for achieving desired conditions. The degree of public visitation on the NLCS was recognized as an opportunity for increased application of social science research on recreation impacts, cultural and historic values, citizen science, and community engagement.

FINDINGS ON THE CHALLENGES FACING SCIENCE IN THE BLM

Like all federal land management agencies, the BLM faces challenges (real and perceived) in meeting the ambitious goal of becoming a "science-informed" organization. Some challenges are inherent to the bureau's complex mission; other challenges stem from organizational structure and culture. Additional challenges are related to work processes and the delivery of science to managers and decision makers. In addition, there are specific challenges to advancing science within the NLCS.

A key challenge facing the BLM is that its mandate for science is fragmented and sometimes not clearly understood or consistently applied by BLM managers. Flowing from this key challenge are several other organizational barriers to advancing science within the BLM: a lack of integration of science across BLM programs and directorates, inconsistent integration of science into BLM decision-making, and lack of consistent policies concerning science. Morale amongst BLM science professionals varies, as does the degree of scientific training of BLM managers.

There are also challenges with BLM work processes related to science. A major issue is improving the scientific foundation of environmental impact statements and assessments (EIS and EA). BLM analyses are often single-dimensional and species-specific, rather than integrative and systems-based. Similarly, the temporal and spatial scales of analyses are often too narrow; e.g. Field Offices' geographic boundaries are typically not the appropriate scale for addressing cumulative impacts and future scenarios. The BLM's reliance on *ad hoc* and reactive scientific efforts limits scientific integration. In addition, there are significant time and resource constraints that hinder the ability of BLM professionals to conduct and apply best available sound science.

Another key challenge is an often slow and less than adequate information transfer—including slow delivery of research results, presentation of results in formats that are of limited used to managers, limited access to data and relevant scientific literature, and lack of advanced

information technology. Inadequate information transfer may in part stem from BLM's often disconnected relationships with science partners, in which BLM lacks clear communication of needs and has limited engagement. The BLM's lack of a workable and consistent system of scientific peer-review for conducted and sponsored research limits the assurance of the scientific quality of products and affects manager's trust in using the scientific products in decisions.

There are also science challenges specific to the National Landscape Conservation System. While conserving "scientific values" is part of the NLCS mission, this mandate is ill-defined and hence not yet fully implemented. Science has a low profile with many NLCS managers and stakeholders. Often, NLCS science is perceived as "marginalized" or separate from broader BLM needs. There is significant lack of awareness of the NLCS value and opportunity amongst the general scientific community.

These challenges, while substantial, are tractable and create opportunities to advance the role of science within the BLM.

RECOMMENDATIONS FOR ADVANCING SCIENCE WITHIN THE BLM

The following recommendations are derived from the review of written documents, the interviews and site visits, and the core team's experience with advancing scientific programs. The recommendations are organized around three categories: a) organizational structure and culture, b) work processes and delivery, and c) distinctive challenges and opportunities for NLCS science.

Organizational Structure and Culture

1. *The BLM should revise appropriate sections of the BLM Manual and/or consider adding a new section in order to explicitly recognize and require that BLM resource decisions should be based on best available sound science, accurate fidelity to the law, and long-term public interest.* This policy will advance science as an essential input into decision-making. The manual should make clear that "science-informed" decision-making is the required standard for managers, and the BLM should invest in the necessary training and preparation of managers to enable this standard to be met.

2. *The BLM should establish a chief scientist position (at the ST level), reporting to the Deputy Director for Operations.* The chief scientist would provide critical science leadership. The BLM chief scientist would lead the development and implementation of science-related policies, processes, and priorities. Additionally, the chief scientist would provide advice, coordinate science across BLM states and directorates, and represent BLM science to other federal land management agencies, the broader scientific community, and stakeholders. The chief scientist should be a member of the Executive Leadership Team (ELT). The chief scientist would lead the implementation of several of the recommendations identified in this report. Line authority over individual scientists should remain within existing structures.

3. *The BLM should re-establish an external national BLM Science Advisory Board.* The board would provide necessary, independent advice on science and science policy to the Director. The board should operate under a FACA charter. It should include outstanding scientists from the external scientific community representing a broad range of relevant disciplines. The chief scientist should serve as liaison to the group.

4. *The BLM should eliminate the multiple and overlapping science committees and replace them with a single internal Science Coordinating Group (SCG).* A single coordinating group would increase efficiency, reduce overlap and unnecessary administrative burden, improve internal communication of science priorities, and focus responsibility for advancing science. The SCG would work with the chief scientist to develop BLM's science-related policies, processes, and priorities. It would include senior scientists and managers from Field Offices, State Offices, Centers, and Washington Office directorates, and be chaired by the Chief Scientist. Identified science leaders from each of BLM's three key work areas (conservation, development, and restoration) should be represented on the SCG. The Chief Scientist would be responsible for gaining support and approval for SCG outputs from the ELT and the Deputy Director. Technical work groups could be temporarily established for specific tasks (e.g. standardizing data, calculating ecosystem services).

5. *The BLM should clarify and communicate the scientific roles and responsibilities of the National Operations Center's Division of Resource Services*. This would improve the effectiveness of the division, clearly connect its work to the BLM mission, and increase awareness of its

services throughout the BLM. The role of the division should be developed collaboratively with BLM offices. Annual or multi-annual scientific responsibilities should be developed in consultation with the Science Coordinating Group.

6. *The BLM should institute ecoregion-based teams of scientists to facilitate and/or conduct scientific efforts for and with BLM State Offices, Field Offices, and NLCS units within that ecoregion.* With limited resources, ecoregion-based teams would enable efficient, coordinated, and relevant science to be proactively identified, conducted, and delivered to decision-makers. Collaboration with other DOI bureaus should be encouraged. Five-to-ten year work plans should be developed for these teams in collaboration with regional BLM leadership and the Science Coordinating Group.

7. *The BLM should accelerate development of a diverse set of qualified scientific partners, and reduce administrative hurdles associated with science partnerships.* Connection to the external scientific community is vital to ensure the application of modern scientific practices for BLM resource management. Collaboration with other DOI bureaus should be encouraged and supported with resources. Staff time needs to be allocated to developing quality partnerships and to working closely with partners before, during, and after projects.

8. *The BLM should invest in maintaining and improving the understanding of science and its application by BLM professionals*. To ensure that scientific understanding is a core tenet of BLM's work, BLM professionals need to be conversant in science and its application to BLM decision-making. Options include increased scientific training, scientist/manager meetings, and the publication of a quarterly science magazine for BLM professionals.

Work Processes and Science Delivery

9. *The BLM should examine each of its work processes and establish specific policies to ensure that science is integrated at relevant junctures*. This is a necessary and essential step to provide clear guidance on the practical actions that can advance science within the BLM. This effort should be the Science Coordination Group's first assignment, with draft policy statements submitted to the Deputy Director. For example, the SCG should develop a set of policies and procedures for the scientific activities required of permittees for each type of land use

authorization. More broadly, the SCG should consider policies that promote integrative, systems-based, multi-scale analyses of resources and impacts to resources; promote communication of uncertainty surrounding data or forecasts used in analyses; and for NLCS units, require the consideration of impacts to designated NLCS values.

10. *The BLM should establish and implement a scientific peer-review policy that applies to BLM funded science products, both internal and external.* Peer-review increases the quality of scientific products, and makes science-informed decisions defensible. The peer review policy should be consistent with OMB requirements currently in place and with the DOI peer review policy now in development. Implementing the policy should be based on producing best available sound science, meeting DOI information quality standards, and operating a peer review system that is efficient, cost-effective, and practical.

11. *The BLM should periodically and systematically identify and prioritize scientific needs, with a focus on supporting future management decisions*. In a period of limited resources, such assessments focus effort, increase effectiveness, and reduce unnecessary costs. Scientific needs should be identified at all levels of the organization, with input from the Science Advisory Board. For example, every NLCS unit should identify its scientific needs. The Science Coordinating Group should propose priorities for these scientific needs and then communicate them internally and externally. In addition, bureau-wide scientific needs that could be best answered in the NLCS should be identified (e.g. experimental testing of best management practices in a limited use environment).

12. *The BLM should provide operational support for rapid adoption of the Assessment, Inventory & Monitoring (AIM) Strategy protocols on all BLM lands.* This will allow systematic assessment of resource conditions at multiple scales and improve the quality of data for decision-making. Bureau-wide adoption of this standardized, quantitative approach should occur as soon as possible. The value of the AIM Strategy protocols should be enhanced by continued development of explicit, consistent, measurable standards for describing resource trends and conditions. Funds from across the bureau that have been historically used for ad hoc assessment, inventory, and monitoring efforts should be redirected towards this standardized approach.

13. *The BLM should ensure that geospatial data is properly collected, curated, analyzed, and distributed in order to support the systematic use of spatial data in decision-making, especially at local levels.* The availability of high quality geospatial data allows for large amounts of disparate information to be incorporated in the decision-making process, as well as communicated to diverse, non-technical audiences. Such data increase the defensibility of BLM decisions and potentially reduce BLM's exposure to litigation. In some cases, interagency collaboration will be the most efficient and cost-effective way to make geospatial data available to BLM managers.

14. *The BLM should establish a centralized, online science permitting and tracking system for both BLM funded and external projects.* This system would ensure research activities are appropriate and maximize the utility of the scientific projects being conducted on BLM lands. The NLCS would be an appropriate pilot location for this system. To properly permit research projects, the BLM should establish guidelines for appropriate scientific use, with specific and distinctive consideration for NLCS units (e.g. ensuring the preservation of NLCS units as benchmark sites). Guidelines should include reporting requirements, such as a brief manager's summary and a full scientific report.

15. *The BLM should enhance delivery of scientific information via a searchable, web-based, data and report portal.* This portal would greatly increase the communication of scientific information. The National Operations Center should develop this portal in consultation with State and Field Offices; the NLCS could pilot its use. Full potential of a web-based data and report portal would be realized if coupled with a modernization of the bureau's information technology infrastructure and policy (e.g. data sharing technology and policy).

Distinctive NLCS Recommendations

16. *The BLM should collaborate in the integration of the NLCS into a landscape-scale conservation network in partnership with the other federal land management agencies*. This network would help to ensure protection for all US ecosystem types, provide a venue to increase collaboration between and amongst agencies, and increase public understanding of federal conservation efforts.

17. *The BLM should systematically identify the "scientific values" of each NLCS unit and ensure the protection, conservation, and restoration of these values.* This would be an important step toward fulfilling the legislative mandate to protect, conserve, and restore scientific values in the NLCS. The BLM should issue guidance directed at NLCS units for identifying scientific values and ensuring their conservation (e.g. via management prescriptions provided in land use plans). Following the identification of NLCS scientific values, the BLM should communicate them to the internal and external scientific communities.

18. *The BLM should establish a standardized framework for periodically assessing how well NLCS units' designated values are protected, conserved, and restored.* Periodic assessment of conditions will improve the NLCS' management and funding effectiveness at both the unit and system level. In addition, these assessments can contribute to increasing public awareness and gaining public support. The assessments should be based on scientific data, collected at both the landscape-scale and the local-scale. Results from these assessments will aid in determining how compatible certain uses are with the NLCS' conservation mandate.

19. *The BLM should invest in a strategic NLCS communications campaign that brands the NLCS as "America's Outdoor Laboratory"*. A communications campaign would expand the scientific community's recognition of the NLCS as a well-known, respected, and useful place for conducting science. Communication techniques could include participation in appropriate scientific meetings, modern web-based communication efforts that describe priority NLCS research topics, and incorporation of scientific findings into outreach materials.

CONCLUSION

The BLM has a critical role in the future of American energy development, resource management, restoration of lands and waters, and conservation. Science is essential to fulfilling these responsibilities. The BLM must advance the role of science within the bureau, improve the integration of science into BLM decision-making, and accelerate the process of accomplishing both these goals. The NLCS, as a valuable national resource and laboratory for science, is a strategic and appropriate element of the BLM to pilot several of this report's recommendations.

BLM-relevant applied science and the usable knowledge that it creates has significant potential return on investment. It can improve decision-making, empower managers at the field, state, and national levels, engage citizens and communities, and increase the efficiency and effectiveness of the bureau. Hence, the need for action is also an opportunity for the BLM to manage its future.

Confronted with heightened resource demands and unprecedented and increasing environmental and socioeconomic change, there is great urgency in BLM acting boldly and decisively. The recommendations in this Director's Report, if implemented, will accelerate the advance of science within and for the BLM.

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